

Claims

1. A side-scattering light guide, comprising:

a transparent optically homogenous elongate core to transmit light along the
5 core from end to end;

an optically transmitting sheath, having a lower refractive index than the
core, surrounding and in contact with the sides of the core;

diffuser particles within the core, the diffuser particles being transparent,
having a refractive index close to that of the core, high optical transmittance, low
10 back reflectance and low absorbance, and being distributed to scatter light being
transmitted along the core so that at least some of the scattered light exits the sides
of the core; and,

a jacket of diffusing material arranged to intercept scattered light exiting the
sides of the core.

15 2. The side scattering light guide of claim 1, wherein the ratio of the diffuser
particles' refractive index to that of the core is essentially constant over the light's
wavelength range.

3. The side scattering light guide of claim 1, wherein the ratio of the diffuser
particles' refractive index to that of the core varies by less than 1% over the light's
20 wavelength range.

4. The side scattering light guide of claim 1, wherein the ratio of the diffuser
particles' refractive index to that of the core varies by less than 0.05% over the
light's wavelength range.

5. The side scattering light guide of any preceding claim, wherein the diffuser
25 particles have a size substantially greater than the light's average wavelength.

6. The side-scattering light guide of any preceding claim, wherein the lower refractive index sheath surrounding said core is transparent.

7. The side-scattering light guide of any one of claims 1 to 6, wherein the lower refractive index sheath surrounding said core is translucent.

5 8. The side-scattering light guide of claim 7, wherein an outer layer of the sheath forms the diffusing jacket.

9. The side-scattering light guide of claim 8, wherein a non-smooth outer layer of the sheath forms the diffusing jacket.

10 10. The side-scattering light guide of claim 1, wherein a rough outer surface of the core forms the diffusing jacket..

11. The side-scattering light guide of claim 10 wherein the rough outer surface is produced by a high concentration of diffuser particles in the core.

12. The side-scattering light guide of any preceding claim, wherein the diffusing jacket surrounds part of the core.

15 13. The side-scattering light guide of claim 12, wherein the jacket surrounds half the core.

14. The side-scattering light guide of any preceding claim, wherein the diffusing jacket is a transmitting diffuser.

20 15. The side-scattering light guide of claim 14, wherein the material of the diffusing jacket is translucent.

16. The side-scattering light guide of claim 15 wherein the jacket is formed of one of polyethylene, PMMA, PTFE, ABS, PVC, or glass.

17. The side-scattering light guide of claim 14, wherein the material of the diffusing jacket is has at least one non-smooth surface.

25 18. The side scattering light guide of any one of claims 1 to 13, wherein the

diffusing jacket is a reflecting diffuser.

19. The side-scattering light guide of claim 18, wherein the material of the diffuser jacket material is opaque and reflective.

20. The side-scattering light guide of any one of claims 1 to 13, wherein the
5 diffuser jacket is both transmitting, and reflective.

21. The side-scattering light guide of any one of claims 1 to 13, wherein parts of the diffuser jacket material are transmitting, and other parts are reflective.

22. The side-scattering light guide of claim 19, wherein the diffuser jacket material is opaque, reflective, and apertured.

10 23. The side-scattering light guide of claim 22, wherein the apertures are surrounded by a transmitting diffuser.

24. The side-scattering light guide of claim 22, wherein the aperture is a longitudinal slit.

25. The side-scattering light guide of claim 1, wherein the light guide is rigid.

15 26. The side-scattering light guide of claim 1, wherein the light guide is flexible.

27. The side-scattering light guide of claim 1, wherein the core is formed of a polymer, such as acrylic.

28. The side-scattering light guide of claim 1, wherein the diffuser particles are formed of polymer, such as a cross-linked polymer, for instance PMMA, or
20 polystyrene.

29. The side-scattering light guide of claim 1, wherein the core is formed of a non-polymer material such as glass.

30. The side-scattering light guide of claim 29, wherein the diffuser particles are formed of non-polymeric material, such as glass or quartz.

25 31. A side-scattering light guide according to any preceding claim, further

comprising one or more optical elements adjacent a side of the light guide to collect and direct side-scattered light from said side-scattering light guide.

32. A side-scattering light guide according to claim 31, wherein the optical element is a lens.

5 33. A side-scattering light guide according to claim 31, wherein the optical element is a mirror.

34. A side-scattering light guide according to claim 31, wherein the optical element is a diffractive element.

10 35. A side scattering light guide according to claim 1, wherein the low refractive index sheath is formed of a fluropolymer or silicone polymer.

36. A side scattering light guide according to claim 1, where the low refractive index sheath is formed of at least one of: poly-tetrafluorethylene (PTFE); copolymers of polytetrafluoroethene and hexafluoropropylene (FEP); and tetrafluorethylene-perfluoralkoxethylene copolymers (PFE); fluoro silicone polymers; 15 polydimethylsiloxane polymers; and polymethylphenylsiloxane polymers.

37. A side scattering light guide according to claim 1, wherein the sheath is a volume of free space.

38. A side scattering light guide according to claim 1, wherein the sheath is gas.

20 39. A side scattering light guide according to claim 1, wherein the sheath is liquid.